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(54) Abstract Title
Reinforced concrete tile

(57) A surface covering, such as a floor, comprises reinforced concrete tiles 30 arranged on parallel spaced rows of concrete beams 31,32 having an inverted T-shaped cross-section. Each tile comprises an outer portion 2 which is peripherally rebated with respect to a central portion 1. On opposing sides of the tile there are indentations (3,4,5,6) in the peripheral rebated portion for accommodating a tool, such as an L-shaped hook, for removing the tile from the surface. The concrete tile is reinforced with a steel mesh 7. The concrete may be coloured by mineral pigments. Tiles are positioned adjacent to each other on the beams and the rebate 8 is filled with sealant material such as grouting. A supporting cap 33 may be provided to sit between the beams and the tiles. Insulating layers (77, 78 Figs 7, 8) and a supporting bracket (90, Fig 9) may be provided.

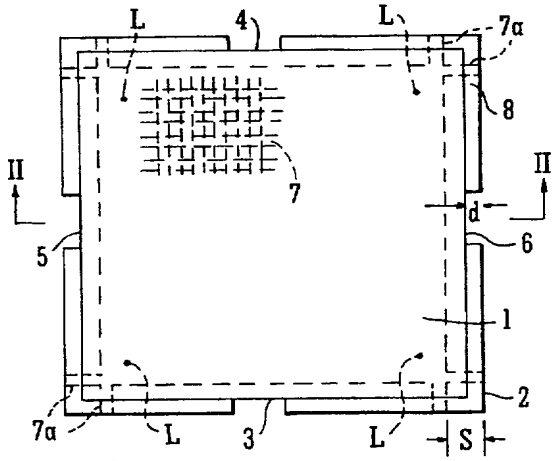

FIG. 1

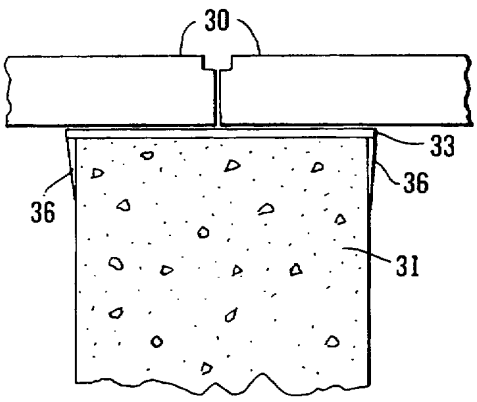

FIG. 5

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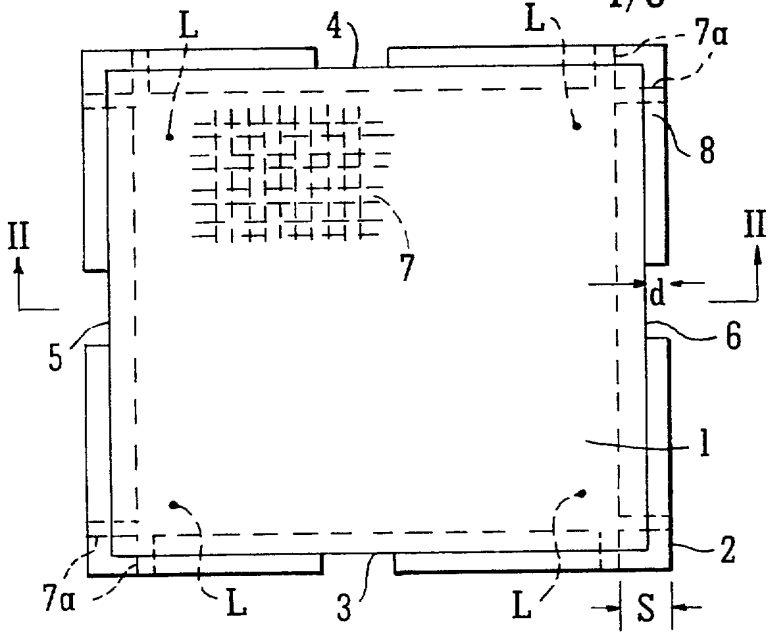

FIG. 1

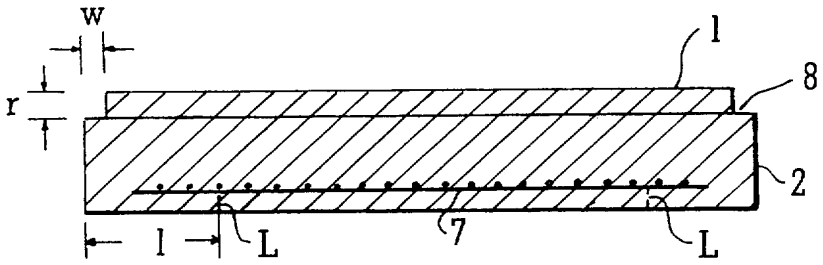

FIG. 2

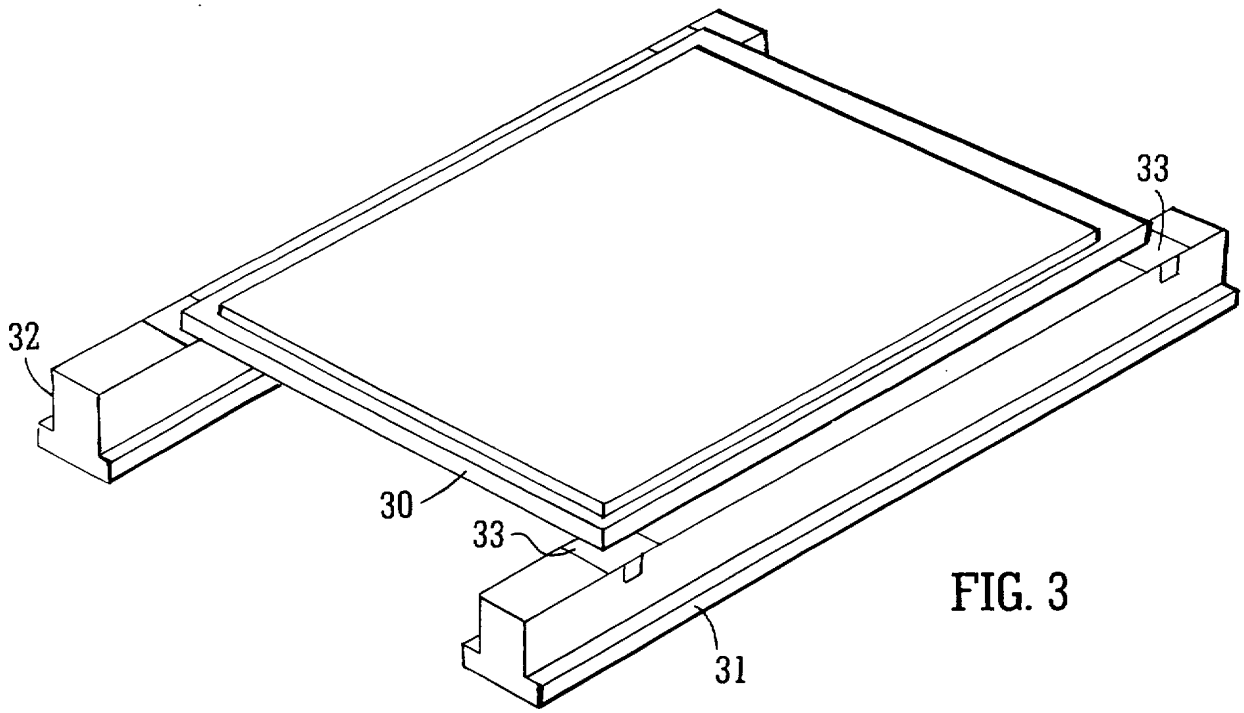

FIG. 3

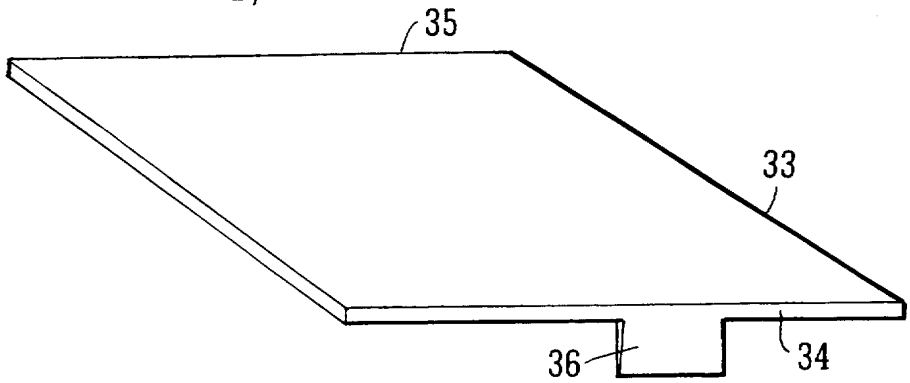

FIG. 4

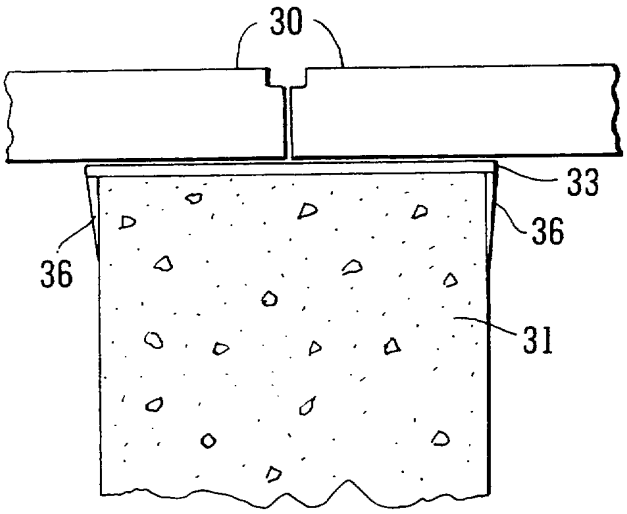

FIG. 5

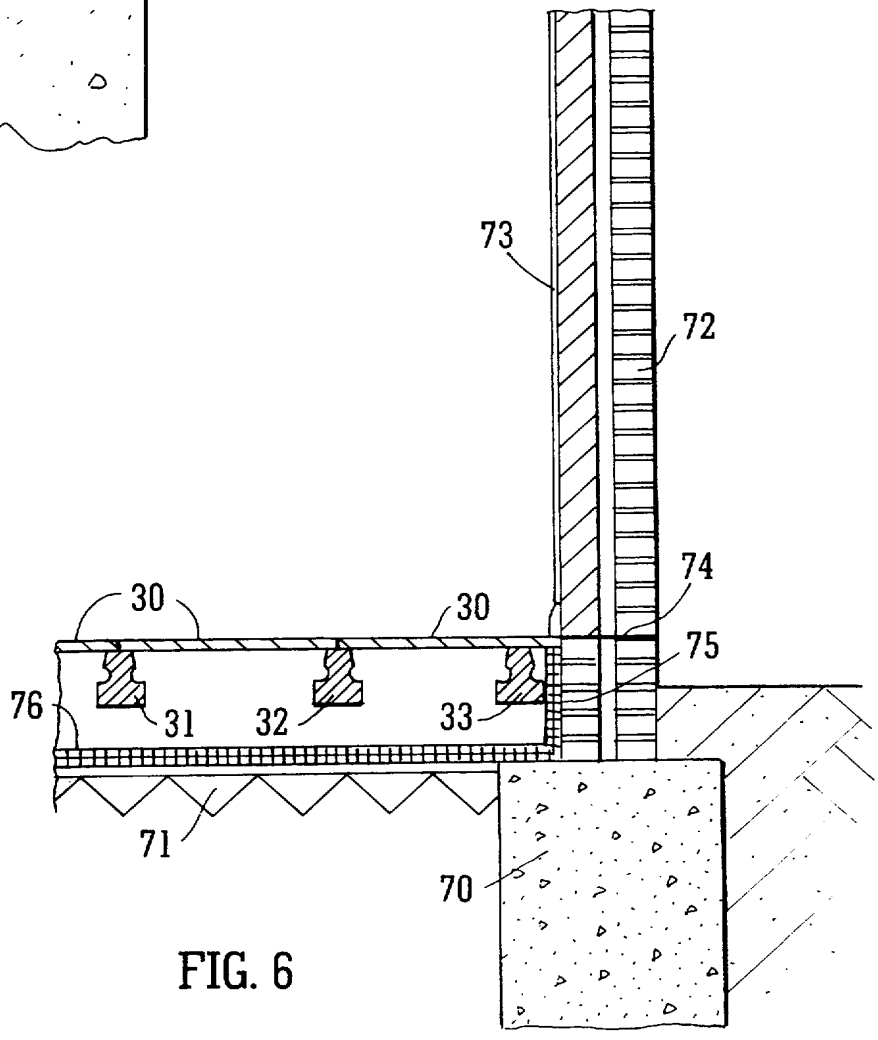

FIG. 6

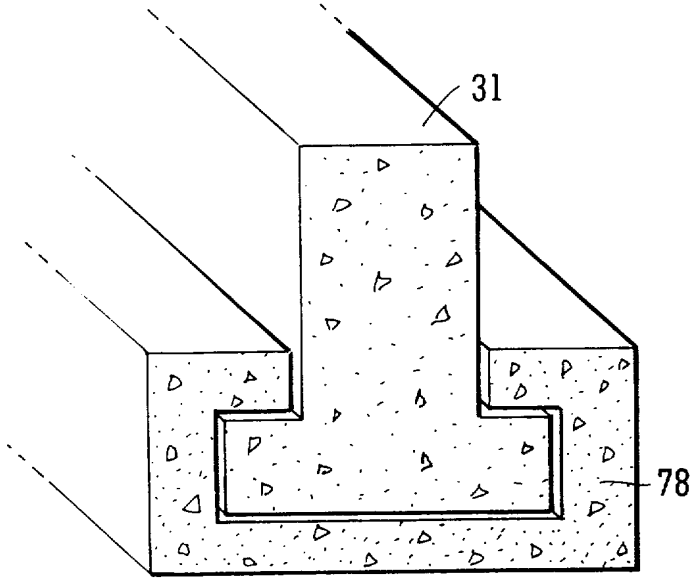

FIG. 8

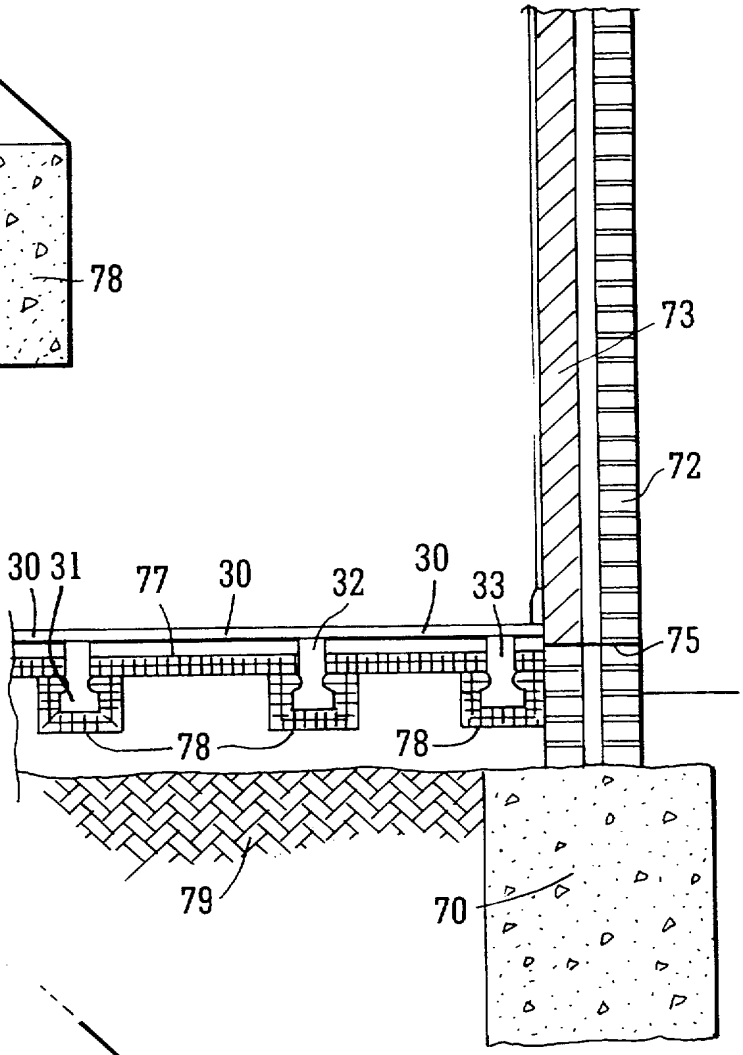

FIG. 7

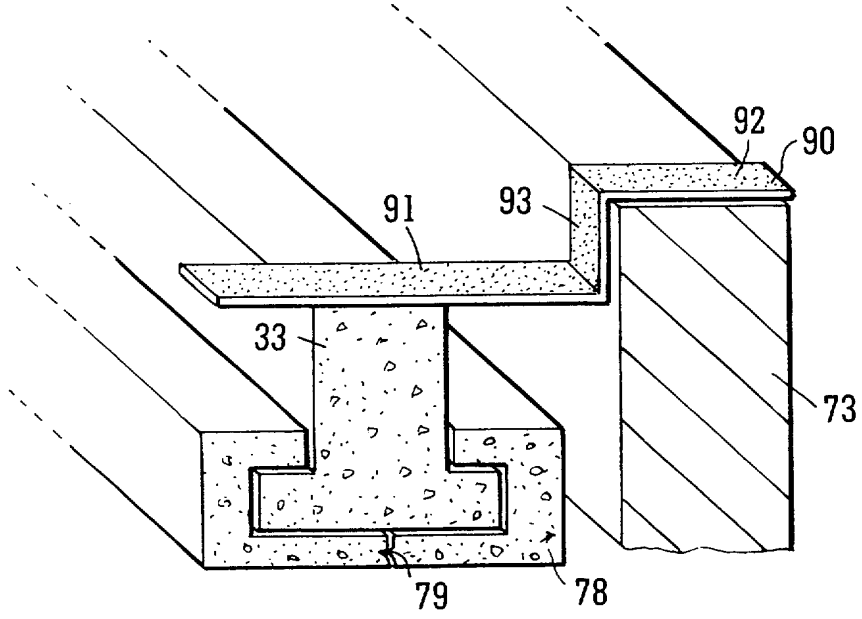

FIG. 9

REINFORCED CONCRETE TILE AND SURFACE COVERING USING THE SAME

This invention relates to a reinforced concrete tile and to a surface covering, particularly but not exclusively a floor, using the reinforced concrete tile.

In the construction industry it is known to provide a floor having substantially parallel spaced pre-stressed concrete beams having an inverted T-shaped cross-section and to locate on the horizontal portion of the T-shape adjacent the vertical member, plural, adjacent, pre-stressed concrete tiles. Such flooring may be used internally or externally of a building and if used internally of a building then the beams are usually mounted in internal walls of the building and supported by the internal walls. Such a manner of construction has the advantage that the construction time is reduced since less preparation is required, and once the beams have been installed, the installation by laying the tiles is fast and can be performed by unskilled workmen. The tiles, once laid, can be instantly used as a working platform, whereas if a concrete, screeded floor is used, it is necessary to wait for the concrete to completely dry and such a type of flooring has the disadvantage that it cannot be laid in inclement weather. The use of a beam and tile floor has the advantage that utility services such as gas pipes, water pipes and electricity cables may be located beneath the tiles and where the beams are supported by internal walls of the building, so the utility services may be located beneath the beams.

A disadvantage of such a known type of flooring is that the tiles cannot be readily lifted to add, replace or repair service facilitates because the tiles are located between adjacent beams. In this respect, it is to be understood that the upper surface of the tiles are in the same plane as the upper surface of the beams, the tiles having a depth the same as the distance between the underside of the horizontal cross piece portion of the T of the beam and the base of the vertical limb of the beam which, in use, is uppermost.

With such a construction, it is extremely difficult to lift the tiles. If the tiles were laid on an upper surface of the beams they would, in accordance with conventional practice, be laid substantially abutting one another and in such an instance dry grouting material would be brushed in the adjoining crack between the tiles. Because such an adjoining crack is extremely small, so an efficient seal is difficult to achieve.

It is an object of this invention to at least partially mitigate the foregoing disadvantages.

In an embodiment of this invention improved insulation of the flooring is obtained.

According to a first aspect of this invention there is provided a reinforced concrete tile comprising a peripheral rebated portion, and at least two indentations formed in opposite edges of the tile for accommodating a tool for removing said tile from a surface.

Preferably, each said indentation has a depth substantially the same as the width of said rebated portion.

Conveniently, said tile is rectangular and each said indentation is a rectangular slot, preferably located substantially mid-way along an edge.

Advantageously, said tile is substantially square in shape.

Conveniently, reinforcing mesh is provided in the central unrebated portion of the tile.

In a preferred embodiment, said mesh is formed of a matrix of transversely arranged circularly cross-sectioned steel rods, or of a matrix of transversely arranged rectangularly cross-sectioned steel strips.

Advantageously, said rods each have a diameter in the range 3-10 mm.

Preferably, said tile is made of a mixture of sand, cement and aggregate according to a relevant building requirement standard known per se and mineral pigment particles are provided in said mixture to colour said tile.

Advantageously, an outer planar surface of said first portion is polished to provide a smooth finish.

Conveniently, said mineral pigment is selected from: Marble, quartz, feldspar, dolomite, granite, basalt, quartzite, and pebbles.

According to a second aspect of this invention there is provided a surface covering comprising means for supporting a plurality of reinforced concrete tiles as defined above located on supporting means, sealing means being located in channels formed by the adjacent rebates of adjacent tiles.

Preferably, said sealing means is grouting material.

According to a third aspect of this invention there is provided a floor including plural substantially parallel spaced rows of pre-stressed concrete beams, and mounted on adjacent beams at least two reinforced concrete tiles as defined above, said tiles being located adjacent one another and substantially covering said beams, utility services optionally being provided beneath said tiles.

Advantageously, sealing means is provided in the rebates of adjacent tiles so as to provide a seal with respect to said beams.

Preferably, each said tile is located on a supporting cap to raise the tile from surface irregularities in the mounting beam.

Where said floor forms an internal floor of a building, conveniently said beams are mounted at each end thereof in a supporting wall of said building.

Where the tile is rectangular, advantageously a supporting cap is provided at each corner of the tile between the tile and an associated mounting beam.

Conveniently, the supporting cap has a pair of lugs which have a remote end thereof biased inwardly of the cap for locating said cap on a beam associated therewith.

In an embodiment, an insulating layer is provide over a base layer and preferably said insulating layer extends up an inside wall of said building toward an underside of said tiles, whereby an air gap is provided between an underside of said beams and said insulating layer.

In a further embodiment, an insulating layer is provided which extends between said mounting beams, and an insulating sheath substantially encompasses at least a portion of each said beam.

Advantageously, said sheath is formed in two longitudinal sections which are adjoined about a longitudinal axis of a beam associated therewith.

Advantageously, a bracket is provided which extends from an inside of a wall of said building to a top surface of an adjacent beam and one of said tiles is mounted on said bracket whereby said tile is supported between said adjacent beam and said wall.

Preferably, a portion of said bracket is located between adjacent vertical courses of said wall.

Conveniently, said bracket is Z-shaped so that location of said bracket between vertically adjacent courses of said wall is at a vertically higher height than said tile.

According to a fourth aspect of this invention there is provided a method of constructing a floor including the steps of laying substantially parallel rows of pre-stressed concrete beams on a supporting surface, and laying on an upper surface of said beams plural reinforced concrete tiles as defined above.

Advantageously, sealing means is provided in the rebate of adjacent tiles so as to provide a seal with respect to said beams.

Preferably, in preparing an oversight for a building, said beams are mounted at each end thereof on a supporting wall of said building.

Advantageously, an insulating layer is provided which extends between said tiles and said mounting beams and an insulating sheath is provided which encompasses at least a portion of each said beam.

Advantageously, said sheath is formed in two longitudinal portions which are adjoined about a longitudinal axis of each said beam and said longitudinal portions are cupped about said beam.

Preferred embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a top plan view of a reinforced concrete tile in accordance with this invention;

Figure 2 shows a longitudinal side view along arrow-headed lines II-II of Figure 1;

Figure 3 shows a perspective view of a tile in accordance with this invention located on a pair of beams;

Figure 4 shows a perspective view of a supporting cap used in this invention;

Figure 5 shows a side view of the supporting cap located between a pair of tiles and a mounting beam;

Figure 6 shows a vertical cross-section through a first embodiment of a floor in accordance with this invention;

Figure 7 shows a vertical cross-section through a second embodiment of a floor in accordance with this invention;

Figure 8 shows a perspective view of an insulating sheath used in this invention; and

Figure 9 shows a perspective view of an insulating sheath and a Z-shaped bracket for supporting a tile.

In the Figures like reference numerals denote like parts.

The reinforced concrete tile shown in Figures 1 and 2 has a rectangular shape, preferably square, with a first, peripheral portion 1 which is rebated with respect to a second central portion 2 and two opposing indentations 3, 4 and 5, 6 are provided substantially mid-way along each side of the tile, each indentation having a depth d substantially the same as the width w (Figure 2) of rebate 8. In a preferred embodiment the tile has sides of 600 mm x 600 mm and is 30 mm – 35 mm in depth. The width w and depth r of the rebate 8 are preferably each 5 mm. On the underside of the tile (not shown) there may be a 75 mm smooth flat surface around the peripheral edge with the inner underside surface of the tile being textured with a surface dictated by the manufacturing process.

Within the portion 2 is a reinforcing steel mesh 7 formed with a matrix of transversely arranged circularly cross-sectioned steel rods each having a diameter advantageously in the range 3 mm – 10 mm and, preferably, in the range 4 mm – 6 mm spaced at 25 mm centres in each orthogonal direction to form a mat having dimensions 580 mm x 580 mm.

Thus the spacing s between the edge of the mesh 7 and the edge of the tile is 10 mm. During manufacture, extensions 7a are formed at the corners of the mesh which locate the mesh within the concrete. Similarly, as also shown in Figure 2, legs L are formed in the mesh at a distance l of 125 mm in from each edge to provide support for the mesh.

The tile is made of a mixture of sand, cement, and aggregate, preferably of size 6 mm or 10 mm, according to the relevant required building standard known per se.

After the slabs have been pressed and to stop any 'slumping' or 'twisting' they will be flat stacked horizontally on trays in a stacking unit. Each sliding part of the stacking unit will be 200 mm in width thus leaving only 200 mm supported in the middle which will stop any distortion in the panel whilst curing takes place.

The specification for the concrete of each tile may be as laid down by British Concrete Standards, e.g.:

For external paving:

PAV-1 = C35 mix = 35N/m^2

PAV-2 = C40 mix = 40N/m^2

Oversight application:

House floors with reinforcement:

RC30 = 30N/m^2

House floors without reinforcement:

GEN1 = 10N/m^2

A mineral pigment of e.g. marble, quartz, feldspar, dolomite, granite, basalt, quartzite or pebbles is provided in the mixture to colour the tile.

The colours imparted by the mineral pigment can be for example, reds, greens, purples, browns, pinks, blacks, greys, or white.

The outer planar surface of the first portion may be polished to provide a smooth finish to a human touch.

In forming a surface covering, each tile is mounted on a support surface which conveniently comprises parallel spaced rows of supporting members. As shown in Figure 3, where a tile 30 is to form a surface covering it is, preferably, mounted on parallel spaced rows of pre-stressed concrete beams 31, 32 having an inverted T-shaped cross-section.

Where the floor forms an internal floor of a building, the beams are usually mounted at each end thereof in a supporting wall of the building. Located under each corner of the tile 30 is a supporting cap 33 to raise the tile from surface irregularities in the mounting beam.

The supporting cap is show in greater detail in Figures 4 and 5 and has, on opposed edges 34, 35 of the cap, depending lugs 36, the lugs having a remote end which is biased inwardly of the cap for locating the cap on the associated beam 31.

In a preferred embodiment the cap is square and has a side of 74 mm and a depth of 2 mm, the lug has a width of 15 mm and a depth of 10 mm.

The tiles 30 are sealed with a grouting compound to prevent ingress of moisture from the upper side of portion to the underside of portion 2 and the grouting compound is located in the rebate of the tiles so that between adjacent tiles there is grouting compound having a width of 10 mm and a depth of 5 mm (since the rebate of each tile is 5 mm x 5 mm). The grouting compound may be a dry sand/cement mixture which is brushed into the rebate and when dampened forms a seal between the tiles.

A first embodiment of a floor will now be described with reference to Figure 6 in which a strip concrete foundation 70 is formed defining the perimeter of a building and a 25/50 blinding layer 71 is provided within the foundation 70; the blinding layer may be constructed on a hard core surface if required. Constructed from the foundation 70 is a cavity wall having an

external wall 72 and an internal wall 73, the walls having a damp-proof course 74 in a conventional manner.

The tiles 30 are supported on beams 31, 32, 33 with the beams being supported in opposing end walls. With pre-stressed concrete tiles 30 having sides 600 mm x 600 mm sealed with grouting, the pre-stressed concrete floor beams are spaced at 600 mm centres.

The blinding layer which forms an oversight is provided with a damp-proof membrane 75 upon which is a polystyrene layer 76, the layer 76 being formed over the blinding layer and up the inside of the inner wall 73 to approximately abut the underside of a tile 30.

An alternative embodiment of a floor in accordance with this invention will now be described with reference to Figure 7 in which insulating polystyrene sheets 77 are located with an air gap beneath the tiles and between each of the beams 31, 32 and 32, 33. Located about the horizontal portion of the T-shaped cross-section of the beams is a sheath 78 of insulating material such as polystyrene having a wall thickness of 50 mm. As will be noted from Figure 7, the insulation 77, 78 substantially encompasses each beam. In the embodiment of Figure 7 the oversight may be untreated soil.

Referring to Figure 8, there is shown a perspective view of a beam 31 having an insulating sheath 78 in which the sheath has an internal opening conforming to the T-shaped cross-section of the beam 31. The opening is such as to allow the sheath 78 to be slid over a beam or, alternatively, it is desirable that the insulating material is sufficiently flexible for the sheath to be "snapped" over the horizontal T-shaped portion of the beam.

An alternative embodiment of the sheath 78 is shown in Figure 9 in which the sheath is formed in two longitudinal sections adjoined about a longitudinal axis of an associated beam (shown in Figure 9 as beam 33). The two portions of the sheath 78 are formed with a tongue and groove 79 to assist in location of an underside (as shown in Figure 9) location of the sheath portions. In the embodiment of Figure 9 it will be understood that each

opposed portion of the sheath may simply be located from a transverse direction over the beam.

So as to prevent an outer peripheral tile 30 from tipping when weight is placed on the tile between a supporting beam and the inner wall, a supporting bracket 90 is preferably provided. Although the bracket may be a flat, planar member, preferably the bracket 90 is Z-shaped so that it has a portion 91 overlying and supported on a beam 33 and a further portion 92 mounted in the internal wall 73 with an adjoining portion 93 substantially abutting an inside surface of the wall 73. It will, thus, be noted that the portion 92 is higher than a tile which will be mounted on portion 91.

When the tile of the present invention is used on a surface covering, it facilitates a good seal between opposing major planar surfaces thereof by virtue of sealant I the rebate 8. By virtue of the indentations 5 it may be easily lifted with a suitable tool, e.g. an L-shaped hook, so that utilities located in the void between the oversight 71 and the underside of the tiles 30 or between the oversight 79 and the underside of the insulating material 77,78 may be readily accessed.

A further advantage of the present invention is that once the tiles have bee laid so they may be used as a surface for further construction of the walls of the building and there is no need to wait, as in the prior art, for the conventionally used screeded floor to set. Also, with the present invention, the provision of an insulating layer has substantial environmental benefits in insulating the floor.

CLAIMS:

1. A reinforced concrete tile comprising a peripheral rebated portion, and at least two indentations formed in opposite edges of the tile for accommodating a tool for removing said tile from a surface.

2. A tile as claimed in claim 1, wherein each said indentation has a depth substantially the same as the width of said rebated portion.

3. A tile as claimed in claim 1 or claim 2, wherein said tile is rectangular and each said indentation is a rectangular slot located substantially mid-way along an edge.

4. A tile as claimed in any of claims 1 to 3, wherein said tile is substantially square in shape.

5. A tile as claimed in any preceding claim, wherein reinforcing mesh is provided in the central unrebated portion of the tile.

6. A tile as claimed in claim 5, wherein said mesh is formed of a matrix of transversely arranged circularly cross-sectioned steel rods, or of a matrix of transversely arranged rectangularly cross-sectioned steel strips.

7. A tile as claimed in claim 6, wherein said rods each have a diameter in the range 3-10 mm.

8. A tile as claimed in any of the preceding claims, wherein said tile is made of a mixture of sand, cement and aggregate according to a relevant building requirement standard known per se and mineral pigment particles are provided in said mixture to colour said tile.

9. A tile as claimed in claim 8, wherein said mineral pigment particle is selected from marble, quartz, feldspar, dolomite, granite, basalt, quartzite, and pebbles.

10. A tile as claimed in any of the preceding claims, wherein a peripheral region of the major surface opposite the major surface in which the rebate is formed is polished to provide a smooth finish.

11. A surface covering comprising tiles as claimed in any preceding claim located on supporting means, sealing means being located in channels formed by the adjacent rebates of adjacent tiles.

12. A surface as claimed in claim 11, wherein said sealing means is grouting material.

13. A floor including plural substantially parallel spaced rows of pre-stressed concrete beams, and mounted on adjacent beams at least two reinforced concrete tiles as claimed in any of claims 1 to 10, said tiles being located adjacent one another and substantially covering said beams, utility services optionally being provided beneath said tiles.

14. A floor as claimed in claim 13, wherein sealing means is provided in the rebates of adjacent tiles so as to provide a seal with respect to said beams.

15. A floor as claimed in claim 13 or claim 14, wherein each said tile is located on a supporting cap to raise the tile from surface irregularities in the mounting beam.

16. A floor as claimed in any of claims 13 to 15, wherein said floor forms an internal floor of a building, said beams are mounted at each end thereof in a supporting wall of said building.

17. A floor as claimed in any of claims 13 to 16, wherein the tile is rectangular, a supporting cap preferably being provided at each corner of the tile between the tile and an associated mounting beam.

18. A floor as claimed in claim 17, wherein the supporting cap has a pair of lugs which have a remote end thereof biased inwardly of the cap for locating said cap on a beam associated therewith.

19. A floor as claimed in any of claims 13 to 18, wherein an insulating layer is provided over a base layer and preferably said insulating layer extends up an inside wall of said building toward an underside of said tiles, whereby an air gap is provided between an underside of said beams and said insulating layer.

20. A floor as claimed in any of claims 13 to 19, wherein an insulating layer is provided which extends between said mounting beams, and an insulating sheath substantially encompasses at least a portion of each said beam.

21. A floor as claimed in claim 20, wherein said sheath is formed in two longitudinal sections which are adjoined about a longitudinal axis of a beam associated therewith.

22. A floor as claimed in any of claims 13 to 21, wherein a bracket is provided which extends from an inside of a wall of said building to a top surface of an adjacent beam and one of said tiles is mounted on said bracket whereby said tile is supported between said adjacent beam and said wall.

23. A floor as claimed in claim 22, wherein a portion of said bracket is located between adjacent vertical courses of said wall.

24. A floor as claimed in either of claim 22 or claim 23, wherein said bracket is Z-shaped so that location of said bracket between vertically adjacent courses of said wall is at a vertically higher height than said tile.

25. A method of constructing a floor including the steps of laying substantially parallel rows of pre-stressed concrete beams on a supporting surface, and laying on an upper surface of said beams plural reinforced concrete tiles as claimed in any of claims 1 to 10.

26. A method as claimed in claim 25, wherein sealing means is provided in the rebate of adjacent tiles so as to provide a seal with respect to said beams.

27. A method as claimed in claim 25 or claim 26, wherein in preparing an oversight for a building, said beams are mounted at each end thereof on a supporting wall of said building.

28. A method as claimed in any of claims 25 to 27, wherein an insulating layer is provided which extends between said tiles and said mounting beams and an insulating sheath is provided which encompasses at least a portion of each said beam.

29. A method as claimed in claim 28, in which said sheath is formed in two longitudinal portions which are adjoined about a longitudinal axis of each said beam and said longitudinal portions are cupped about said beam.

30. A reinforced concrete tile substantially as described hereinabove with reference to Figures 1 and 2 of the accompanying drawings.

31. A floor substantially as described hereinabove with reference to Figures 3 to 6 optionally as modified in accordance with any of Figures 7, 8 and 9 of the accompanying drawings.

32. A method of laying a floor substantially as described hereinabove with reference to Figures 1 to 6 optionally as modified in accordance with any of Figures 7, 8 and 9 of the accompanying drawings.

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Claims searched: All

Examiner: James Hull
Date of search: 30 October 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): E1D (DF133, DCG)

Int Cl (Ed.7): E04B (5/04)
E04C (2/06)

Other: ONLINE DATABASES: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2096213 A	JONES FREDERICK. See Figures. A manhole cover with indentations 15 on opposite edges of the cover for the insertion of a lifting tool 17.	
A	GB 638444 A	SHANKS. See Figures. A paving slab with inclined grooves 2, so that a 'specially designed crowbar' can be used to release the slabs.	
A	EP 0663485 A1	FRY HEATH & SPENCE. See Fig 3. Flooring tiles with edge rebates 16 for grouting purposes.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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EUR-CL (EPC): E04B005/48 , E04B005/04 , E04F015/08